

# 11

## Role of Government and Industrial Policies

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Sustainable and healthy economic growth cannot be achieved without continuous industrial upgrading at the disaggregated level, which in turn depends critically on how market and state play their roles (Lin 2011; Lin and Wang 2019b). Over the past forty years, China has worked at developing what is officially referred to as a socialist market economy with Chinese characteristics. Despite a wide array of mistakes and problems, China's central and local governments have played an overall effective and positive role in facilitating structural change and industrial upgrading, promoting market-oriented reforms, embracing trade globalization, and enhancing national power. The average annual GDP growth rate for the past forty years is 9.4 percent, and China is now the second-largest economy in the world, with a per capita GDP equal to US\$9,432 in 2018.

Despite the economic achievement, however, the past few years have witnessed a ferocious academic debate over whether China should continue to exercise the industrial policies that undergirded its rise to prominence (Lin et al. 2018). In fact, industrial policies have returned to the spotlight in policy debates and academic research worldwide since the 2008 global financial crisis (see, for example, Aghion and Roulet 2014; Rodrik 2008). Moreover, President Trump's administration keeps criticizing China's government for using inappropriate industrial policies that violate World

Trade Organization (WTO) rules and hurt the U.S. economy; these charges have fueled a trade war between China and the United States. Thus, industrial policies and the role of government in China have become the core controversial policy issues, in theory and in practice.

This chapter addresses the following two questions: What are the major challenges in industrial upgrading that China faces today and will face in the next three decades? And, after forty years of reform and opening up, how should China adjust its industrial policies in the next thirty years?

The chapter is organized as follows. First, I discuss the major challenges China is facing in its industrial upgrading process. Second, I describe theoretically, from the new structural economics point of view, what guiding principles China should follow when formulating appropriate industrial policies. Third, from a practical point of view, I document the basic facts about industrial policies in China's Made in China 2030 initiative, which is a focus of U.S. actions against China under Section 301 of the Trade Act of 1974 in the ongoing trade war between China and the United States. I do so to demonstrate the real-life complexity of formulating and implementing industrial policies in China in the context of today's globalized world. Fourth, I discuss how China should adjust its industrial policies in the next thirty years. A brief conclusion ends the chapter.

## **MAJOR CHALLENGES IN INDUSTRIAL UPGRADING**

The major challenges in industrial upgrading China faces at present and will face in the next thirty years are all structural in nature. The world's largest middle-income country, China is undertaking four structural processes simultaneously—the only country in the history of the world to undertake these processes at the same time (Wang 2017). These changes are being enacted in a country with a vertical structure and facing the sandwich effect—pressure from less-developed and more-developed countries simultaneously—and industrial policies should take all these important elements into account.

*Process One: Structural Transformation and Industrial Upgrading.* In almost all countries, as per capita GDP increases, resources are reallocated from agriculture to manufacturing and then to service, as a result of which the employment share of agriculture declines over time, the

curve denoting manufacturing's share of employment exhibits a hump shape, and the service share keeps increasing. These changes in sectoral employment and resource use with economic growth are referred to as "Kuznets facts," and together they describe the structural transformation process. In addition, industrial upgrading occurs at the more disaggregated industry level from labor-intensive and low-value-added industries to capital-intensive, high-value-added industries.

*Process Two: Economic Transition.* Like other transitional economies, China is still in the process of institutional reform as it moves from a centrally planned economy to a market economy. The more market-oriented reform is being conducted in a gradualist, dual-track approach.<sup>1</sup>

*Process Three: Economic Globalization.* Like most other countries, China is deeply engaged in trade globalization, especially after its accession to the WTO in 2001. In fact, China is the largest exporting country in the world. Moreover, the volume of China's cross-border capital flow is also skyrocketing. Liberalization of the capital account and internationalization of the renminbi (RMB) are issues that regularly attract attention from the international community. International technology transfer is the third dimension of the economic globalization in which China is engaged. However, technology transfer faces uphill battles with respect to protection of intellectual property (IP) rights and talent flow.

*Process Four: China's Rise as a Global Geopolitical Power.* Together with its economic growth, China's influence can be felt more and more strongly in the international arena in diplomatic, military, and political affairs. In particular, the elaboration of the Belt and Road Initiative (BRI) is perceived by the international community as an important geopolitical strategy of China.

Whereas none of the above four processes is unique to China, what is unique is that China is simultaneously experiencing all four processes as a large country. Consequently, it is much more difficult to understand the appropriate role of the government and the suitable industrial policies that should be implemented.

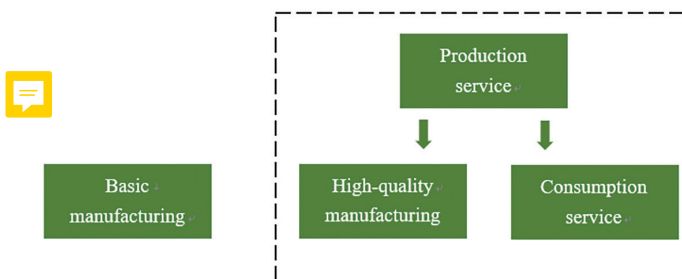
### Challenge One: Developing Production Service

To successfully escape its recent history as a middle-income country, China must accomplish a healthy economic structural transformation from manufacturing to service, and also effect an industrial upgrading from basic manufacturing to high-quality manufacturing, which is related to the first structural process listed above.<sup>2</sup>

In figure 11-1, manufacturing is decomposed to basic manufacturing and high-quality manufacturing, and service is divided into production service and consumption service. There is input-output linkage between these sectors: production service is used as intermediate input for high-quality manufacturing and consumption service.

The production service sector (including financial services, telecommunications, and business services such as R&D) in China exhibits a relatively high administrative barrier to entry, and therefore is inefficient as a result of lack of market competition. The underdevelopment of production service then strangles the structural transformation and industrial upgrading because both consumption service and high-quality manufacturing require production service as a crucial intermediate input. On the other hand, in keeping with Engel's law, both high-quality manufacturing of consumption goods and consumption service have relatively high income demand elasticities, so that consumers' demand for these two increases disproportionately more when income increases. As a result, supply is unable to satisfy demand, which may result in weak domestic demand and even economic stagnation.

FIGURE 11-1. Industrial Upgrading and Structural Transformation



Moreover, there may exist self-fulfilling expectations and multiple equilibria in a *laissez-faire* market economy. If firms expect optimistically that demand for production service will be high, they might choose to enter the production service sector and produce, as a result of which production service would become cheaper owing to competition, which in turn would also make both consumption service and high-quality manufacturing cheaper relative to basic manufacturing consumption; thus consumers' demand for high-quality manufacturing and consumption service would increase because of both the substitution effect and the income effect, so the induced demand for production service would indeed increase, which would fulfill the initial optimistic belief that the demand for production service will be high. In this case, the economy would reach a high equilibrium featuring more industrial upgrading to high-quality manufacturing and more structural transformation from manufacturing to service. Likewise, a pessimistic belief about future demand is also self-fulfilling and leads to a low equilibrium. Whereas the high-equilibrium position always Pareto dominates the low-equilibrium one, the high-equilibrium position itself is still not the first best choice because of pecuniary externality: each individual firm in the production service sector cares only about achieving its own objective, without taking into account the impact on other firms in the same sector or the impact on the downstream sectors (consumption service and high-quality manufacturing) through the input-output linkage.

As a result, there could be delayed structural change and hindered industrial upgrading or premature deindustrialization and herding industrial upgrading in the *laissez-faire* market equilibrium. The policy implication, therefore, is that government should overcome the market failure by better coordinating firms' behavior through subsidies or taxation. On the one hand, government should provide the necessary hard infrastructure and policy support to incentivize firms to upgrade to the appropriate new industries to avoid economic stagnation; on the other hand, government should also be alert to speculative investment in "hot" sectors such as real estate markets or premature deindustrialization into low-value-added service sectors. Moreover, China should lower the (administrative) entry barrier to the production service, which is imperative for industrial upgrading and structural transformation at this stage of development.

### Challenge Two: Mitigating the Sandwich Effect

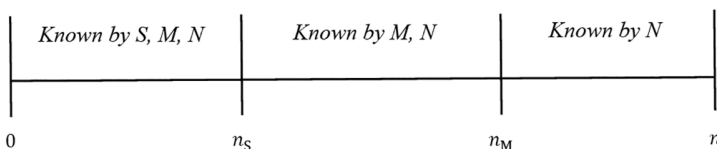
As a large middle-income country deeply involved in trade globalization (see the third process in the list above), China faces a sandwich effect in the global market. That is, poorer countries, those with a lower cost of labor than China, chase China by technological imitation and overtaking industries in which China is losing its comparative advantage; meanwhile, richer countries, those with a greater innovation capacity than China, exert pressure on China by extracting monopoly rents on high-technology products that are exported to China or even by reducing the speed of technology diffusion to China by strengthening the enforcement of international IP rights protections or, in extreme cases, by exercising sanctions, especially in cases of high-end key technological products, which may paralyze the whole value chain in China.<sup>3</sup>

To illustrate this idea more formally, imagine there are three countries in the world: North, Middle, and South, denoted by N, M, and S, respectively. There are  $n$  different products, all of which are tradable, as shown in figure 11-2.

Different countries have access to different sets of technologies: country S only knows how to produce a subset of products  $[0, n_S]$ , country M knows how to produce a larger subset  $[0, n_M]$ , and country N knows how to produce all products. Since labor cost is lowest in South and highest in North, in market equilibrium, all products in the interval  $[0, n_S]$  will be produced only in S, all products in the interval  $(n_S, n_M]$  will be produced only in country M, and all products in the interval  $(n_M, n]$  will be produced only in country N. To be more concrete, S, M, and N could be thought of as Vietnam, China, and the United States.

When Vietnam enhances its technological capabilities by imitation, it can expand the range of products it produces, so  $n_S$  becomes larger, which means the total number of products that China will produce be-

FIGURE 11-2. Sandwich Effect



comes smaller. In other words, some industries (products) are reallocated from China to Vietnam because production cost is lower in Vietnam. As a result, China exports less and the world-induced demand for China's labor also becomes smaller, so wages in China would decrease relative to wages in the United States. This in turn would increase the per capita GDP gap between China and the United States. This is the chasing effect. On the other hand, when the United States adopts policies to reduce technological diffusion from the United States to China,  $n_M$  becomes smaller, which also increases the per capita GDP gap between China and the United States. This is the pressing effect. Moreover, it can be shown that the larger the country size of a middle-income country, the stronger the sandwich effect it faces.

In addition to technology policies, the sandwich effect may also work through trade policies. For example, when the United States increases the tariff imposed on imports from China, it reduces the demand for China's products and hence increases the GDP gap between the United States and China. Should the United States and Vietnam mutually reduce their bilateral tariff levels while keeping the tariff rates on their imports from China, that would also hamper China's convergence to the U.S. per capita GDP. In reality, trade policies and technology policies are sometimes initiated not merely for economic purposes but also for geopolitical purposes, as described in process four in the list given above.

The policy implications for China are that it should enhance its innovation and imitation capabilities to counteract the pressing effect from the United States. At the same time it should also increase productivity on the goods it knows how to produce in order to counteract the chasing effect from Vietnam. Industrial policies in China must take into account the entirety of the sandwich instead of only focusing only on the interaction with the United States. If China fails to switch quickly enough from an investment-based growth mode to an innovation-based mode, all four structural processes mentioned earlier will inevitably slow down.

Moreover, China should continue to be actively engaged in the world trade system instead of isolating itself. This also suggests that China must be prepared for the possible geopolitical risk of being isolated from the global trade system or the technology diffusion system. In particular, for those high-end products that China imports and that are difficult to substitute, China's government must assess the likelihood of supply termination

and the consequent potential damage, as well as determine appropriate actions to take as a backup solution.

### **Challenge Three: Correcting Government Incentives behind Industrial Policies**

China features political centralization and economic decentralization.<sup>4</sup> One important criterion by which to evaluate the performance of local government officials is the regional GDP growth rate. The yardstick competition among local governments fosters market competition in tradable goods among different regions (local governments) and facilitates market-oriented reforms in goods markets, but it is less effective in reforms of factor markets because the latter requires nationwide market integration. Moreover, the practice of local experimentation first and then advocating nationally after success, which works well for reforming the goods markets, may not work for factor market reforms. This is related to the second structural process (economics transition process) mentioned earlier.

China was in a state of shortage when it began its economic reforms after decades of central planning, so the GDP tournament among local governments has proven effective in boosting supply and stimulating growth. After forty years of market-oriented reforms, the bottleneck for most commodities is on the demand side. The key objectives of market-oriented reforms are to reduce resource misallocation (factor market reforms) and to undertake supply-side reforms to meet the changes of effective demand. At this new stage of development, the GDP criterion plus the requirement of maintaining social stability could easily induce local governments to oversubsidize and protect inefficient local industries or firms (especially state-owned enterprises), resulting in industrial overcapacity and resource misallocation, especially when the economy is in recession (Wang 2017).

As a vivid example, during the 2010–2014 period, steel was considered an industry with overcapacity in China, so the central government took stringent measures to reduce the steel output. One policy was to require local governments to shut down steel plants of a size below a certain threshold value. To survive, those small plants tried their best to expand their capacity to meet the minimum size requirement. Local governments knew what was happening, but they had no incentives to stop this expansion behavior because local GDP, employment, and tax revenues all went up with these



investments. Consequently, a policy meant to reduce industrial capacity turned out to serve the exactly opposite purpose.<sup>5</sup> As a result of the ferocious domestic competition among steel firms backed by each local government, China's exporting price of steel was so low that it triggered a series of anti-dumping retaliations by the EU and the United States. However, the overcapacity problem of steel came about not because of any purposeful export subsidy policy on the part of the central government but rather because of incentives to local governments to protect local GDP and local employment.

Another political-economic reason behind many failed industrial policies in China is the lack of effective mechanisms to punish government officials for their wrong industrial policies. When the central government issues industrial policies to support a certain industry, it is often safe for local governments to blindly follow these policies even when that industry is not consistent with the comparative advantages of the region. This is because the local government can obtain free financial support from the central government so long as it implements the national policy. There is nothing to lose. All local governments think this way, which naturally leads to investment herding, rent-seeking behaviors, and overcapacity. One such example is the photovoltaics industry in China, which suffered tremendously from this sort of national expansion policy around 2012.

The policy recommendations are to adjust the criteria by which local government officials are evaluated to meet the new challenges in China's new stage of development. In particular, local government should play a greater role in facilitating local industries' growth, and independent third-party post hoc evaluations of industrial policies should be undertaken more seriously and the results made public. Meanwhile, the central government should be more cautious when advocating any industrial policy nationwide; cost-benefit analyses must be more cogent before a policy is announced and implemented. For the central government, the key challenge is how to make the "compelled reform" mechanism continue to work in the future.

## **HOW TO FORMULATE APPROPRIATE INDUSTRIAL POLICIES**

The theoretical rationale for industrial policies is to correct market failures, which are rampant, especially in developing countries. The standard argument against implementing industrial policies is that government failure

dominates market failure because government may not have better information than entrepreneurs in the market, or government may be captured by vested interest groups, so industrial policies would be more likely to result in resource misallocation and rent seeking.<sup>6</sup>

In China's case, there still exist tremendous government distortions, the legacy of central planning, that must be eliminated through market-oriented reforms; thus industrial policies become even more controversial. A key challenge is how to distinguish good from bad industrial policies, insofar as China is still going through an economic transition.

From the analytical viewpoint of new structural economics, there are five types of industries: (1) catching-up industries: those whose technologies are still distant from the global technological frontier, such as machinery equipment; (2) leading industries: those that are already on the global technology frontier, such as high-speed rail and home appliances; (3) exiting industries: those gradually losing comparative advantages and moving out of China, such as apparel and footwear; (4) (short-cycle) leapfrogging industries: those overtaking the technological levels of more advanced economies, typically industries that feature rapid innovation and intensive human capital investment, such as online payment systems and 5G technology; and (5) long-cycle strategic industries: those related to national defense and economic security, such as weaponry, warships, and aerospace industries. An industry's type may shift over time, and the relative proportions of these five types change as China develops.

The roles of government and industrial policies are different for different types of industries. For catching-up industries, a category that includes most of China's industries today, government should facilitate technology adoption and diffusion. Setting up industrial parks is an example of a facilitating policy. Foreign firms with better technologies are encouraged to make direct investment by establishing plants in the industrial park, where the infrastructure and business environment are generally better than what is available outside the park.

For China's leading industries, such as household appliances and high-speed railway, we must rely on its own R&D to achieve technological progress, so the government should follow the practices of developed countries, such as improving the patent system, encouraging innovation, and, if necessary, supporting such industries through government purchases. Moreover, the products of these industries are typically aimed at the international

market, so the government could help firms find intermediaries overseas and penetrate new markets abroad.

For exiting industries, government should facilitate the geographic re-deployment of the firms to places with lower labor costs so that firms can remain viable and continue to be profitable, which increases GNP instead of GDP. Moreover, government could also provide or support training programs for domestic workers in these industries to help them find jobs in other industries or accumulate transferable skills needed to upgrade the industries in a higher-value-added direction.

For leapfrogging industries, human capital is a key factor, and government should facilitate attracting international and domestic talents relevant to those industries, offer tax incentives and R&D subsidies, and provide sufficient hard infrastructure and facilitating policies for those industries.

The firms in long-cycle strategic industries are not necessarily economically viable because the industries may not enjoy a comparative advantage, but the government still needs to support them for national security purposes by providing long-term subsidies for production and R&D, making government purchases, and so on. Likewise, for industries that touch on national economic security, such as certain high-end chip makers, without which the whole supply chain would be paralyzed and the economy would suffer substantial damage, the government should encourage domestic firms to produce these goods to ensure a stable supply, or at least should increase the percentage of domestic content steadily. This industry type differs from the previous four types in that it is typically inconsistent with comparative advantage, but government should still protect it because of geopolitical risks.

China's state capacity may institutionally help the development of strategic industries, but how to incentivize local governments to play appropriate roles in relation to the other four types of industries becomes increasingly difficult owing to regional heterogeneity and the changing international environment.

## **DISAGREEMENT OVER INDUSTRIAL POLICIES BETWEEN CHINA AND THE UNITED STATES**

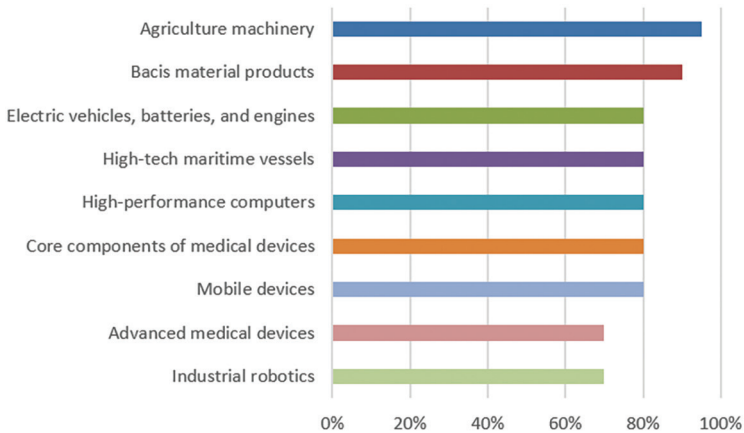
Any serious discussion of China's current and future industrial policies must address the current U.S.-China trade war. The Trump administration

officially increased its tariff from 10 percent to 25 percent on Chinese imports worth US\$200 billion on May 10, 2019. This was followed by a public announcement three days later that the U.S. government planned to impose the 25 percent tariff on a broader array of Chinese imports worth US\$300 billion. China's government retaliated by increasing its tariff on U.S. imports worth US\$60 billion on June 1, 2019. There is no sign the two sides will be able to reach an effective agreement to permanently end this escalating trade war in the near future. The impact of the trade war between the largest two economies in the world is profound. Negotiations between the two countries go beyond the arena of pure trade. China's industrial policies have become the key target of criticisms the U.S. government has lodged against China and the key subject of negotiations.

The Made in China 2025 strategic plan has been a focus of the Trump administration in its Section 301 actions against China and is frequently cited by the U.S. government as evidence of China's official industrial policies. Made in China 2025 is an initiative formally launched by Prime Minister Li Keqiang in 2015 as a ten-year plan aimed at securing China's position as a global powerhouse in high-tech industries. The initiative establishes nine priority tasks, including (1) improving manufacturing innovation, (2) integrating technology and industry, (3) strengthening the industrial base, (4) fostering Chinese brands, (5) enforcing green manufacturing, (6) promoting breakthroughs in ten key sectors, (7) advancing restructuring of the manufacturing sector, (8) promoting service-oriented manufacturing and manufacturing-related service industries, and (9) internationalizing manufacturing. The ten key sectors that are explicitly listed as strategic ones that China's government should promote are (1) aerospace, (2) robotics, (3) new-energy vehicles, (4) high-technology shipping, (5) artificial intelligence and next-generation information technology, (6) biotechnologies, (7) energy and power generation, (8) advanced railway equipment, (9) new materials, and (10) agricultural machinery. In addition, the initiative also seeks to build forty innovation centers in China by 2025.

The concrete quantitative goal of Made in China 2025 is to reduce China's reliance on foreign technology and increase the domestic market share of key Chinese products. For example, the plan specifies that by 2020, 40 percent of essential spare parts and key materials will have domestic sources, and that figure should increase to 70 percent by 2025. The domestic content goals for different products are shown in more detail in figure 11-3.<sup>7</sup>

FIGURE 11-3. Domestic Content Goals for Various Products in Made in China 2025



In addition, China's government sets quantitative targets to improve the key performance indexes of the manufacturing sector. For instance, it specifies that R&D as a percentage of sales revenue in the manufacturing sector should increase from 0.95 percent in 2015 to 1.68 percent by 2025, the annual labor productivity growth rate should increase to 6.5 percent by 2025, and so on. Figure 11-4 shows the detailed goals of the key performance indicators of the four categories enumerated by the initiative, *Made in China 2025*.<sup>8</sup>

From China's point of view, it currently faces the challenge of hitting the middle-income trap, so it must upgrade its industries, enhance its innovative capabilities, and improve the quality of products or risk losing its comparative advantage in labor-intensive industries and low-value-added products because of rapidly rising labor costs. The *Made in China 2025* plan explicitly notes that "China's manufacturing sector is large but not strong, with obvious gaps in innovation capacity, efficiency of resource utilization, quality of industrial infrastructure and degree of digitalization. The task of upgrading and accelerating technological development is urgent" (Morrison 2019). This self-assessment is accurate, to the point, and highly consistent with the analyses offered in this chapter. To ensure sustainable growth, China must make its manufacturing stronger along the directions outlined in this initiative. In some sense, this initiative was inspired by Germany's Industry 4.0, a national strat-

FIGURE 11-4. Key Performance Indicators in Made in China 2025

Category	Manufacturing transformation KPI	2015	2025
Innovation capability	1. R&D cost / revenue (%)	0.95	1.68
	2. Patents / billion RMB of revenue	0.44	1
Quality and value	3. Manufacturing quality competitiveness (index)	83.5	85.5
	4. Manufacturing value-added increase over 2015 (%)	—	4
	5. Average annual labor productivity growth (%)	—	6.5
IT and industry integration	6. Broadband penetration (%)	50	82
	7. Digital R&D and design tool penetration (%)	58	84
	8. Key process control rate (%)	33	64
Green industry	9. Energy decrease over 2015 / industrial value-added (%)	—	34
	10. CO <sub>2</sub> decrease over 2015 / industrial value-added (%)	—	40
	11. Water use decrease over 2015 / industrial value-added (%)	—	41
	12. Industrial solid wastes utilization ratio (%)	65	79

egy launched in 2013 to consolidate German technological leadership in mechanical engineering.

Whereas the legitimacy of China's goals to upgrade its manufacturing and develop its own economy can be hardly challenged by other countries, the U.S. government is very unsatisfied with how China tries to achieve these goals. Moreover, the United States has expressed concern over China's long-term objective, which is that by 2049, the centenary of the founding of the People's Republic of China, China will have become the leader among the world's manufacturing powers. U.S. trade representative Robert Lightizer issued the following statement on June 15, 2018: "China's government is aggressively working to undermine America's high-tech industries and our economic leadership through unfair trade practices and industrial policies like Made in China 2025."

Critics of Made in China 2025 contend that the domestic content target

policy advocates import substitution and violates the WTO rules. They also fear that China's government provides extensive financial subsidies to domestic firms involved in those target sectors, or supports acquisitions of foreign technology companies and IP, because these would give Chinese firms unfair advantages in the global competition and technology upgrading. Overall, this plan is viewed as major evidence that China is still not a free market economy and that state intervention is too comprehensive. The U.S. government, in particular, also fears that Made in China 2025 could empower China to eventually replace the United States as the global leader in the advanced manufacturing areas. These concerns are also shared by other Western developed countries.

In response to these criticisms, the Chinese government defends by arguing that the Made in China 2025 initiative still emphasizes the basic principle that China shall continue to deepen its market-oriented reforms and let markets play the decisive role in resource allocation. Moreover, the government policies mentioned in that initiative are transparent, open, and nondiscriminatory, and they are merely guiding principles instead of concrete execution plans. Those numbers are suggested goals, not mandates. Many even hold the view that the U.S. government criticizes this initiative not because it is wrong but because it can enhance the competitiveness of Chinese firms and therefore jeopardize the leading position of the United States in the global advanced manufacturing arena. Why should China have to stop making progress just because the United States does not like it?

The disparate views of the two sides have already resulted in severe consequences that go much beyond the current trade war between the two largest countries in the world. It fuels national distrust against each other and injects a large degree of uncertainty into the global economy. All countries start to worry about what would happen if the world trading system were to be divided into different blocs or collapsed completely, and what would happen if another cold war commenced. The trend of threats followed by the tit-for-tat imposition of punitive tariffs could easily lead to disaster, and therefore the United States, China, and many other countries must make efforts to put a halt to it.

It is beyond the scope of this chapter to undertake a complete analysis of the U.S.-China disputes over industrial policies and trade policies, but a good understanding of the basic facts involved in this conflict should help us consider what China should do in the future.

## **HOW SHOULD CHINA ADJUST ITS INDUSTRIAL POLICIES IN THE NEXT THIRTY YEARS?**

The largest challenge to China as the country formulates and implements industrial policies is the need to take into account the four co-occurring structural processes, along with China's situation as a large, middle-income country subject to the sandwich effect. Any industrial policy package has to strike an appropriate balance because of potential trade-offs hardwired into those different structural processes at this level of development.

More concretely, China should consider the following points when adjusting its industrial policies.

- Accelerating the market-oriented reforms in factor markets would enable China to reduce its reliance on controversial industrial policies to achieve efficient resource allocation. In contradistinction to the mature market economies of developed countries, China still suffers distortions in factor markets, partly inherited from the central planning regimes and partly resulting from the gap between efficient supplies of pertinent production factors and the changing demand for those factors as the industrial structures endogenously evolve. For example, once the market of venture capital is sufficiently well developed in China, a large fraction of R&D expenditure could be efficiently financed by the market itself, instead of relying on government subsidies. Based on the analysis presented earlier, the fraction of leading industries and leapfrogging industries in the whole economy is expected to increase as China grows, so the financial market should be efficient enough to quickly respond to support this change.
- Except for long-cycle strategic industries, all the other four types of industries should be developed only when they are consistent with comparative advantage (Ju, Lin, and Wang 2011, 2015). Correspondingly, local government should be given more freedom to formulate industrial policies for those four types of industries based on local conditions. This would help to reduce the risks devolving from central planning and overcapacity.



- IP rights protection in domestic markets should be more strictly enforced to encourage indigenous innovation, and the quality of tertiary education must be urgently improved to provide high-skilled talent, which is vital especially for leading industries and leapfrogging industries in China (Tang, Wang, and Zhou forthcoming). How should China go about creating an innovation-friendly business environment, one that could attract global talents and facilitate innovation? Shenzhen sets a good example for other cities in China. How should China encourage firms to make global profits based on hard-core innovation capability instead of merely exploiting arbitrage opportunities in policies? Huawei is a model in this regard.
- The instruments for executing national industrial policies should be improved. Generally speaking, tax rebates should be preferred to additional subsidies, other things being equal, because the former are not only simpler to implement but also are less distorting and less controversial. Moreover, as China approaches high-income status, it should learn from how developed countries formulate and implement their industrial policies to foster innovation, and adapt these approaches to the Chinese environment (Wang and Hua forthcoming).
- Optimal industrial policies are different for the five different types of industries, according to the new structural economics. A given industry may shift from one type to another as it develops and its type may be different in different regions, so some means should be in place to adjust dynamically industrial policies for the same industry and the same location. For example, academic research shows that export-processing zones are overall quite successful as an industrial policy for the labor-intensive stage of production (such as assembly), but as labor costs rise, that policy may become less and less effective, especially in developed regions, so original export-processing zones should be transformed into other types of industrial parks as the comparative advantage changes.
- Based on the vertical structure analyses, production service deserves special attention in China's industrial policies because it is increasingly important for industrial upgrading in manufacturing and for the

structural transformation from manufacturing to service. Key obstacles to production service are the relatively high entry barrier and the dominance of state-owned firms (see Du and Wang 2013; Li, Liu, and Wang 2016), so China should give priority to forwarding the market-oriented reforms in this sector to enhance market competition. Otherwise production service is likely to become a universal bottleneck that strangles the downstream private sector and results in stagnation in the aggregate economy (Lin and Wang 2019a).

- Based on the sandwich effect analysis in this chapter, China as a middle-income country should adjust its industrial policies to respond not only to the behaviors of developed economies but also to the behaviors of countries that are closely chasing China. The main thrust of industrial policies is to enhance innovation capacity when China is competing with more advanced economies and to improve efficiency and raise labor productivity when China is competing with countries with lower labor costs. Moreover, the optimal speed at which industrial policies are adjusted should take into account the changes in the chasing effect from the south and the pressing effect from the north (Wang and Wei 2019).
- Instead of emphasizing the domestic content goals of the core industries and products, which may scare other countries if they see them as import substitution policies, China's industrial policies should highlight helping markets identify the key components, products, or industries that not only have higher value added but also are consistent with China's latent comparative advantage, and then provide a facilitating role for industrial upgrading, including the provision of industry-specific infrastructure and the elimination of existing policy impediments, which are academically sound and practically more aligned with market-oriented reforms.
- China should be fully aware of its large size and the resulting global impact of its industrial policies. In the future, it should carefully assess the potential global impact of any of its newly proposed major industrial policies and, when necessary, make serious efforts to maximize the level of acceptance from the international community. For ex-

ample, the joint concerns over and public criticisms of Made in China 2025 by Western developed countries are partly the result of inadequate advance communication from China to the community of developed countries. China should do more than justify industrial policies based on what China needs; it should also evaluate the likelihood that such policies will generate positive spillover for the rest of the global economy. China would not have to worry about this if it were a small or low-income country.

- With the presence of potential geopolitical risks associated with China's rise as a global geopolitical power, the fourth structural process, China must have a plan B for strategic industries in case of hostile supply cutoff of key components by foreign countries. China should identify such politically vulnerable bottlenecks in its industrial development and support the establishment of backup facilities for national defense and economic security purposes.

## **CONCLUSION**

This chapter revisited an old yet unsettled fundamental question in economics, namely, the role of government and industrial policies, and our analysis is made in the concrete context of China's economic development for the next thirty years. The central point is that challenges to China's industrial upgrading are structural and dynamic in nature, featuring four simultaneous structural processes, a vertical structure, the sandwich effect, and the political-economic interaction between central and local governments. Using the analytical framework of new structural economics, I showed theoretically how different industrial policies should be adopted for five different types of industries, based on each stage of economic development. Then I explored as a real-life case study the international disagreement over the practice and legitimacy of China's industrial policies pertinent to the current trade war between China and the United States and showed how industrial policies in China can be extremely controversial. Based on these analyses, ten guiding principles were proposed for how China should adjust its industrial policies over the next three decades.